



Review Article

What do we know about brief interventions for physical activity that could be delivered in primary care consultations? A systematic review of reviews



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ABSTRACT

This systematic review of reviews aims to investigate how brief interventions (BIs) are defined, whether they increase physical activity, which factors influence their effectiveness, who they are effective for, and whether they are feasible and acceptable. We searched CINAHL, Cochrane database of systematic reviews, DARE, HTA database, EMBASE, MEDLINE, PsycINFO, Science Citation Index-Expanded and Social Sciences Citation Index, and Scottish Intercollegiate Guidelines Network from their inception until May 2015 to identify systematic reviews of the effectiveness of BIs aimed at promoting physical activity in adults, reporting a physical activity outcome and at least one BI that could be delivered in a primary care setting. A narrative synthesis was conducted. We identified three specific BI reviews and thirteen general reviews of physical activity interventions that met the inclusion criteria. The BI reviews reported varying definitions of BIs, only one of which specified a maximum duration of 30 min. BIs can increase self-reported physical activity in the short term, but there is insufficient evidence about their long-term impact, their impact on objectively measured physical activity, and about the factors that influence their effectiveness, feasibility and acceptability. Current definitions include BIs that are too long for primary care consultations. Practitioners, commissioners and policy makers should be aware of this when interpreting evidence about BIs, and future research should develop and evaluate very brief interventions (of 5 min or less) that could be delivered in a primary care consultation.

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Abbreviations: BI, brief intervention; PA, physical activity; VBI, very brief intervention.

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1. Introduction

There is strong evidence that physical activity benefits health (Lee et al., 2012), and that physical inactivity is a major health problem worldwide and an important modifiable risk factor for non-communicable diseases (NCDs) such as cardiovascular disease, some cancers and type 2 diabetes (Lee et al., 2012). Furthermore, physical activity is not increasing, despite more countries having a physical activity policy or plan (Sallis et al., 2016), and it has been estimated that physical inactivity cost healthcare systems INT\$53.8 billion worldwide in 2013 (Ding et al., 2016). Physical inactivity is a large-scale problem that requires a large-scale solution. However, currently there is a lack of effective physical activity interventions that are low-cost and can be implemented at scale and fully-embedded in a system (e.g. primary care) (Reis et al., 2016).

Given the public health burden associated with sedentary lifestyles, there is a need for effective, scalable, low-cost interventions to enhance the adoption and maintenance of regular physical activity along the continuum of individual and population-based interventions. One promising avenue is so-called 'brief interventions' (BIs) in health care settings. The 'make every contact count' (MECC) agenda in the UK (Public Health England et al., 2016) has highlighted how a relatively 'low-cost' programme that capitalises on the opportunity that practitioners in health care settings have to support behaviour change in their patients can improve population level behaviour change. Additionally, in the UK, the National Institute for Health and Care Excellence (NICE) recommends that primary care practitioners deliver tailored, 'brief' physical activity advice to inactive adults, and follow this up at subsequent appointments (National Institute for Health and Care Excellence, 2013). In this guidance, NICE defines brief advice as: "*verbal advice, discussion, negotiation or encouragement, with or without written or other support or follow-up. It can vary from basic advice to a more extended, individually focused discussion*" (National Institute for Health and Care Excellence, 2013, p. 7). A recent systematic review suggested that BIs may be as effective as more intensive interventions (Orrow et al., 2012a), supporting the idea that BIs delivered in primary care have the potential to reduce the public health burden of inactivity at relatively low-cost (Public Health England et al., 2016).

However, there is currently no agreed definition as to what constitutes a 'brief' intervention, and varying definitions have been used for "brief interventions" and "brief advice" (National Institute for Health and Care Excellence, 2013; Orrow et al., 2012a; Campbell et al., 2012; National Institute for Health and Care Excellence, 2007, 2012, 2008, 2010a, 2010b). Consequently, uncertainty remains about how BIs are defined and the effectiveness of brief physical activity interventions that could be delivered in a primary care consultation. Therefore, it is timely to examine what is known about these BIs from published systematic reviews. Although we were particularly interested in evidence from BIs delivered in primary care, the purpose of this review was to investigate any BIs that could *potentially* be delivered in the primary care

setting. We therefore used an inclusive approach to the available literature and aimed to include reviews of BIs delivered in any setting where the population was similar to that in primary care (i.e. apparently healthy and/or at-risk; not requiring specialised treatment). We conducted a systematic review of reviews to identify: (i) how BIs are defined; (ii) whether interventions defined as brief increased self-reported and objectively measured physical activity; (iii) which factors influenced the effectiveness of BIs; (iv) who BIs were effective for; and (v) whether BIs were feasible and acceptable.

2. Methods

2.1. Search strategy and selection criteria

We undertook a systematic review that followed the PRISMA guidelines (Moher et al., 2009) and was based on a protocol (*The Very Brief Intervention Programme, n.d.*). The following databases were searched without date restrictions: CINAHL, Cochrane database of systematic reviews, Database of Abstracts of Reviews of Effects, Health Technology Assessment database, EMBASE, MEDLINE, PsycINFO, Science Citation Index-Expanded and Social Sciences Citation Index (date last searched May 2015). Where possible, searches were limited to those in the English language. The search strategy, tailored for each database (see Additional file 1), was comprised of four filters: physical activity terms (e.g., walking), incremental or reduction terms (e.g., increase), intervention-related terms (e.g., counselling) and review design terms (e.g., systematic). The Scottish Intercollegiate Guidelines Network website (Scottish Intercollegiate Guidelines Network, n.d.) and first author's personal collection were also searched (date last searched May 2015).

We initially used an inclusive approach in which eligible reviews satisfied the following criteria: (1) published systematic reviews or meta-analyses, determined by title or method, in the English language; (2) inclusion of adults (at least 18 years of age) of any health status, except a) those undergoing rehabilitation to return to, or maintain, normal levels of physical functioning, b) those receiving interventions in secondary or tertiary care (e.g. outpatient care or where treatment involved a specialist), c) those having serious conditions (e.g. cerebral palsy) that require specialist support not typically available in primary care or d) athletes; (3) a primary aim of reviewing interventions promoting lifestyle physical activity, defined as "...self-selected activities, which include all leisure, occupational, or household activities that are at least moderate to vigorous in their intensity and could be planned or unplanned activities that are part of everyday life." (Dunn et al., 1998, p. 399); (4) inclusion of physical activity or sedentary behaviour as an outcome (e.g., objective or self-reported physical activity or sitting time) or proxy measures of physical activity or sedentary behaviour (e.g. exercise capacity, physical fitness, energy expenditure, TV viewing); and (5) inclusion of interventions delivered one-to-one with a face-to-face

component. We included reviews irrespective of the design characteristics of included primary studies.

We undertook further screening to identify reviews with specific relevance to our research questions. Reviews fell into two groups: 1) brief intervention reviews (BI reviews) with a primary focus on BIs evidenced by title and/or search strategy; and 2) general physical activity intervention reviews (PA reviews) which a) included one or more interventions described as 'brief' in a subgroup analysis or narrative synthesis, or b) reported narrative or quantitative analyses, including moderator analysis, on the basis of contact time between providers and participants (a proxy for BIs).

2.2. Screening and data extraction

Following de-duplication one reviewer screened titles for exclusion. Pairs of reviewers used standardised pro formas to screen reviews for eligibility based on abstracts and full texts, respectively. A third reviewer resolved any disagreements. Reviewers were not blind to administrative details of the reviews. Data were extracted about definitions of BIs, references of studies described as brief or very brief, quantitative or narrative analyses of BIs and contact time, effectiveness, factors influencing

effectiveness, who BIs were effective for, feasibility, acceptability, and key discussion points and conclusions about BIs related to our research questions. Quality assessment was conducted using the validated 11-item AMSTAR tool (Shea et al., 2009) for all included reviews. We calculated scores ranging from 0 (low quality) to 11 (high quality). A second reviewer double-checked extracted data and ratings, and a third reviewer resolved any disagreements. We retained reviews for data synthesis irrespective of their quality, and conducted a narrative synthesis.

3. Results

Initial screening identified ninety-eight potentially eligible reviews (Fig. 1). Following full-text screening, sixteen reviews met the inclusion criteria and were eligible for data extraction. Three of these reviews focused on BIs (BI reviews) (Campbell et al., 2012; Lawlor and Hanratty, 2001; NICE, 2006) (see Table 1 for details of the included BI reviews) and thirteen focused on physical activity interventions in general (PA reviews) (Avery et al., 2012; Chase, 2015; Cleland et al., 2013; Conn et al., 2008, 2011, 2002, 2009; Eakin et al., 2000; Hobbs et al., 2013; Neidrick et al., 2004; Ogilvie et al., 2007; Orrow et al., 2012b; Smith, 2004) (see Table 2 for summary details of the included PA reviews).

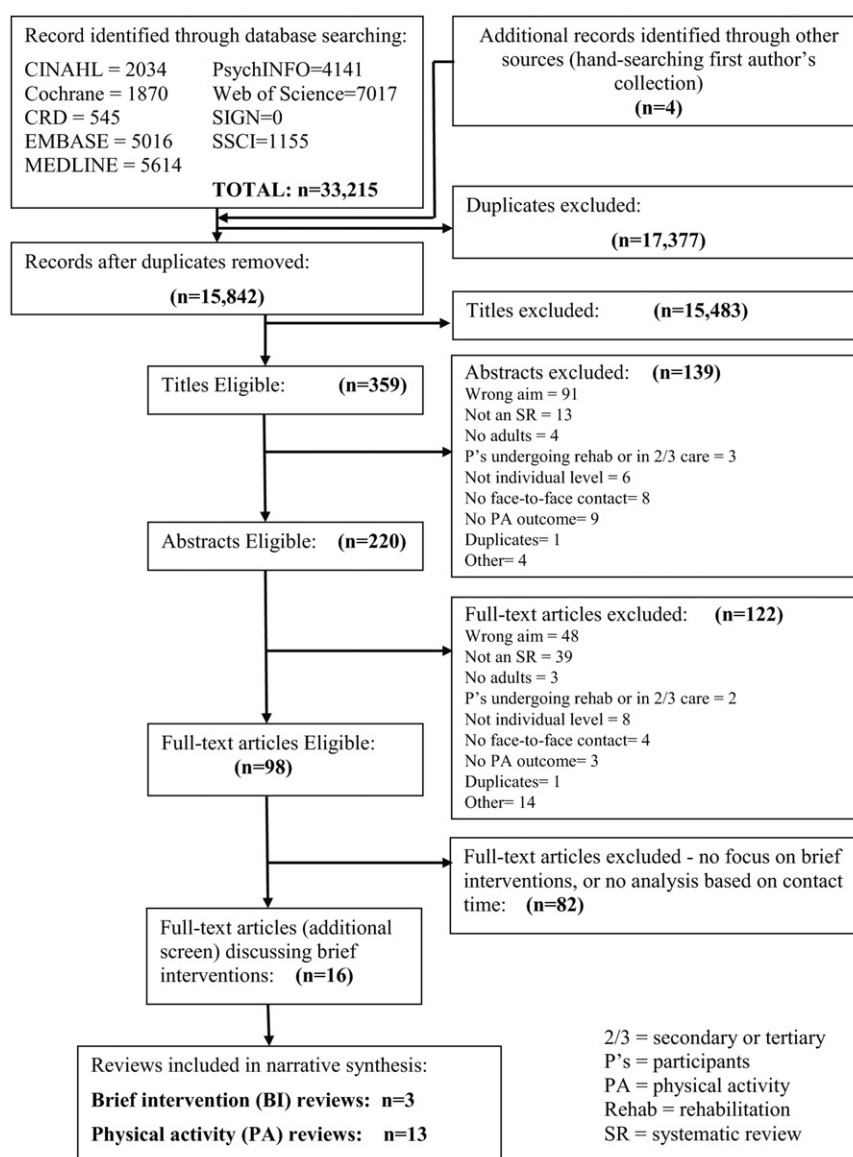


Fig. 1. PRISMA flow diagram of articles excluded and included in the systematic review of systematic reviews and meta-analyses.

Table 1

Characteristics of brief intervention reviews included in the systematic review of reviews.

| Study | Type of review | Aim | Inclusion/exclusion criteria | Key outcomes | AMSTAR Quality Score | N studies (N participants) | Period searched |
|----------------------------|-------------------------------------|---|---|---|----------------------|--|-------------------|
| Campbell et al. (2012) | Systematic review and meta-analysis | To investigate the effectiveness of, and the barriers and facilitators for, brief advice interventions in primary care to promote physical activity in adults | Intervention: Brief advice (verbal advice, discussion, negotiation or encouragement, with or without written or other support or follow-up) to promote physical activity, or local infrastructure and systems that facilitate the delivery of brief advice in primary care settings Design: None specified Population: Adults 19 and over Setting: GP surgery, health centre or other primary care setting, or delivered by primary care professionals in other settings | Physical activity, cardio-respiratory fitness, mental health outcomes. Barriers and facilitators to implementation of brief advice physical activity interventions | 6 | 21 studies: 16RCTs; 5nRCTs (13,493) 46 barriers and facilitators studies (15,156) | 1990 to 2012 |
| Lawlor and Hanratty (2001) | Systematic review | To determine the effect of advice given in routine primary care consultations on levels of physical activity | Intervention: Advice (verbal/written/other forms) given within a routine consultation with the aim of increase physical activity Design: Controlled research design (randomised or non-randomised) with a control group that did not receive advice to increase physical activity Population: None specified Setting: Primary care | Physical activity | 5 | 8 studies: 2 RCTs; 6 nRCTs (5102) | 1966 to Dec 2000 |
| NICE (2006) | Systematic review | To examine the effectiveness of brief interventions in primary care to increase physical activity in adults | Intervention: Brief intervention to increase physical activity Design: Controlled research design (with a control or comparison group), with measures at baseline and from 6 weeks post intervention Population: Adult population Setting: Primary care | Self-reported or objective physical activity or physical fitness outcomes | 4 | 10 studies: 7 RCTs; 3 nRCTs (6898) | 1990 to June 2005 |

Abbreviations: RCT = randomised controlled trial, nRCT = non-randomised controlled trial, PA = physical activity, BI = brief intervention.

Of the three BI reviews, one was a recent NICE evidence review (Campbell et al., 2012) which updated an earlier review (NICE, 2006). The BI reviews included: nine papers describing eight unique studies (including two cluster randomised controlled trials) (Lawlor and Hanratty, 2001); 12 papers describing ten studies (including seven cluster or individual randomised controlled trials and one cost-effectiveness evaluation) (NICE, 2006); and 22 papers describing 21 studies (including 15 cluster or individual randomised controlled trials) (Campbell et al., 2012) (see Fig. 2 for overlap). One BI review also included 46 studies of barriers and facilitators of BI delivery and uptake (Campbell et al., 2012). All three BI reviews included only BIs delivered in primary care and/or intervention delivery by a primary care practitioner. Quality scores were 4 (NICE, 2006), 5 (Lawlor and Hanratty, 2001), and 6 (Campbell et al., 2012) on the 11-point AMSTAR scale (Table 1); none reported on status of publications for inclusion, duplicate study selection and extraction, publication bias or conflicts of interest.

Of the thirteen included PA reviews, six included one or more interventions described as 'brief' in a subgroup analysis or narrative synthesis (Cleland et al., 2013; Eakin et al., 2000; Neidrick et al., 2004; Ogilvie et al., 2007; Orrow et al., 2012b; Smith, 2004), and seven performed a statistical analysis or narrative synthesis based on contact time (Avery et al., 2012; Chase, 2015; Conn et al., 2008, 2011, 2002, 2009; Hobbs et al., 2013) (see Table 2). Five of the PA reviews included interventions delivered in any setting (Cleland et al., 2013; Conn et al., 2008, 2011, 2002, 2009); four of the PA reviews included only interventions delivered in primary care (Eakin et al., 2000; Neidrick et al., 2004; Orrow et al., 2012b; Smith, 2004); three of the PA reviews did not specify a setting as an inclusion criterion (Chase, 2015; Hobbs et al., 2013; Ogilvie et al., 2007); and one included only interventions delivered in clinical and community settings (Avery et al., 2012). Quality scores for the PA reviews ranged from 3 (Neidrick et al., 2004; Smith, 2004) to 8 (Avery et al., 2012; Hobbs et al., 2013; Orrow et al., 2012b) on the 11-point AMSTAR scale (Table 2).

3.1. Definitions of brief interventions

Of the sixteen included reviews, only the three BI reviews provided a priori definitions of BIs, but used the term "brief advice" (Table 3). A BI was defined as having a maximum duration of 30 min (Campbell et al., 2012) or consisting of a single core consultation (Campbell et al., 2012; Lawlor and Hanratty, 2001; NICE, 2006). Two BI reviews included brief advice plus additional components such as written support and follow-ups (Campbell et al., 2012; NICE, 2006). These broad and inclusive definitions of BIs resulted in a wide range of included BIs. For example, all three BI reviews included a study by Bull and Jamrozik (1998) which involved a BI consisting of a single 2–3 min session of 'tailored' advice, plus a printed pamphlet; whereas two BI reviews (Campbell et al., 2012; NICE, 2006) included a study by Elley et al. (2003) which involved a much more resource-intensive BI consisting of an initial 7–13 min session of brief advice and a written prescription, plus quarterly newsletters and an additional 3 telephone calls of 10–20 min each over 3 months made by an exercise specialist from a local sports foundation. Other BIs included in the three BI reviews consisted of verbal advice with or without materials (e.g., pamphlets, action planners, exercise prescriptions, leisure centre passes), counselling, motivational interviewing and step testing, and included follow-up components such as visits, phone calls and newsletters (Hillsdon et al., 2002; Marcus et al., 1997; Goldstein et al., 1999; Grandes et al., 2009; Petrella et al., 2003; Harland et al., 1999).

3.2. Effectiveness of brief interventions

All three BI reviews reported that BIs increased self-reported physical activity in the short-term (4–12 weeks) compared with usual care (Table 4). One BI review reported that BIs increased self-reported physical activity in the "long-term" (defined as 12 weeks or more) and that this was possibly due to follow-up sessions (NICE, 2006). The remaining

Table 2

Summary details of the thirteen physical activity reviews included in the systematic review of reviews.

| Study | Type of review | Inclusion/exclusion criteria | AMSTAR Quality Score | N | Method of comparison | Key outcomes/conclusions |
|-----------------------|-------------------------------------|---|----------------------|---|--|---|
| Avery et al. (2012) | Systematic review and meta-analysis | Intervention: Behavioural interventions targeting free-living PA and exercise Design: RCT Population: Adults 18 years or older with type 2 diabetes Setting: Clinical and community settings Outcome: Change in HbA1c | 8 | 17 RCTs | Moderator analyses based on contact time (number of contacts) | No significant effect of number of contacts on effect sizes for HbA1c: Interventions of greater intensity (median ≥ 14 contacts), were not associated with clinically significant improvement in HbA1c. |
| Chase (2015) | Meta-analysis | Intervention: PA interventions Design: None specified Population: Community-dwelling older adults 65 years and older Setting: None specified Outcome: Subjective or objective PA, sufficient data to calculate effect sizes. | 6 | 46 two-group treatment vs control intervention studies 33 single group pre-posttest intervention studies | Moderator analyses based on contact time (number of intervention sessions, session duration in minutes, and total intervention duration in minutes) | No significant effect of number of intervention sessions, session duration, or total intervention duration on PA effect sizes. |
| Cleland et al. (2013) | Systematic review and meta-analysis | Intervention: Any intervention focused on increasing PA Design: RCTs and nRCTS Population: Community-dwelling, socio-economically disadvantaged women aged 19–64 years Setting: Any setting Outcome: Change in PA or PA-related outcome (e.g. cardiorespiratory fitness) | 7 | 11 RCTs 8 nRCTs | Narrative summary: Includes interventions described as 'brief' | One RCT out of the 19 included studies reported an intervention described as brief: • Albright et al. (2005) compared G ₁ , a home-based phone and mail intervention which included "brief, structured PA telephone counselling (10–15 min)" with a control G ₀ (a home-based mail intervention). SMD -0.13 (95% CI -0.59 – 0.33) in favour of control group. |
| Conn et al. (2008) | Meta-analysis | Intervention: Patient education interventions to increase PA Design: Multiple designs Population: Chronically ill participants >18 years old Setting: Any setting Outcome: PA behaviour, sufficient data to calculate effect sizes. | 5 | 213 samples from 163 reports | Moderator analysis based on contact time (in minutes) | No significant effect of contact time on effect sizes for physical activity. |
| Conn et al. (2011) | Meta-analysis | Intervention: Interventions to increase PA Design: Multiple designs Population: Healthy adults Setting: Any setting Outcome: PA behaviour | 5 | 358 reports | Moderator analysis based on contact time (in minutes) | No significant effect of contact time on effect sizes for physical activity. |
| Conn et al. (2002) | Meta-analysis | Intervention: Interventions to increase PA Design: Multiple designs Population: Adults aged 60 years or older Setting: Any setting Outcome: Overall PA or episodic exercise behaviour, sufficient data to calculate effect sizes. | 6 | 43 studies | Moderator analysis based on contact time (in minutes) | Significant relationship between contact time and physical activity effect size: Studies with greater levels of contact time had larger effect sizes ($d^* = 0.44 \pm 0.13$, $k = 14$) than studies with relatively low levels of contact time ($d = 0.19 \pm 0.12$, $k = 14$). * d = effect size weighed by sample size and controlling for design features. |
| Conn et al. (2009) | Meta-analysis | Intervention: Interventions to increase PA Design: Multiple designs Population: Diagnosed with cardiovascular disease, at least 18 years of age. Setting: Any setting Outcome: PA behaviour, sufficient data to calculate effect sizes. | 5 | 100 samples from 79 reports | Moderator analysis based on contact time (in minutes) | Significant relationship between contact time and physical activity effect size: The amount of contact time between subjects and interventionists was related positively to PA outcomes. |
| Eakin et al. | Narrative | Intervention: Interventions | 6 | 9 RCTs | Narrative summary: Includes | Brief durations of 3–10 min associated |

Table 2 (continued)

| Study | Type of review | Inclusion/exclusion criteria | AMSTAR Quality Score | N | Method of comparison | Key outcomes/conclusions |
|------------------------|-------------------------------------|--|----------------------|---|---|---|
| (2000) | review | to increase PA Design: RCT or quasi-experimental study with a comparison group Population: None specified. Setting: Primary care Outcome: At least one measure of PA | | 6 quasi-experimental studies | interventions described as 'brief' | with significant physical activity increases in the short-term. |
| Hobbs et al. (2013) | Systematic review and meta-analysis | Intervention: Interventions to promote long-term PA change Design: RCTs Population: Healthy participants or 'at risk' of chronic disease; mean/median age of 55–70 years. Setting: None specified Outcome: Objective or self-report PA ≥ 12 months after randomization | 8 | 21 RCTs | Sub-group analysis based on contact time (number of contacts) | No statistically significant difference in intervention effect between interventions with ≥ 11 contacts and those with < 11 contacts. |
| Neidrick et al. (2004) | Narrative review | Intervention: Interventions to increase PA Design: None specified Population: Older adults, aged 50 years or older. Setting: Primary care Outcome: Adherence to PA | 3 | 11 studies (8RCTs; one qualitative study) | Narrative summary: Includes interventions described as 'brief' | Brief advice was effective at increasing physical activity in two of six studies reporting interventions with a single initial visit lasting 3–15 min. <ul style="list-style-type: none"> • Goldstein et al. (1999): No sig. effect. • Pfeiffer et al. (2001): Sig. increase in PA. • Petrella et al. (2003): Sig. increase in PA. • Pinto et al. (2005): No sig. effect. • Marki et al. (2006): No sig. Effect. • Armit et al. (2009): No sig. effect. |
| Ogilvie et al. (2007) | Systematic review | Intervention: Interventions to increase walking Design: RCTs, or controlled before and after experimental or observational studies Population: None specified Setting: None specified Outcome: Objective or self-report measure of walking at both baseline and follow-up | 6 | 48 studies (19 RCTs, and 29 nRCTs) | Narrative summary: Includes interventions described as 'brief' | Brief advice was effective at increasing walking in two of six studies (5 RCTs): <ul style="list-style-type: none"> • Purath et al. (2004): Sig. increase in walking. • Calfas et al. (1996): Sig. increase in walking. • Kerse et al. (1999): No sig. effect. • Halbert A et al. (2000): No sig. effect. • Halbert B et al. (2001): No sig. effect. • Norris et al. (2000): No sig. effect. |
| Orow et al. (2012b) | Systematic review and meta-analysis | Intervention: Interventions to increase PA or fitness Design: RCT Population: Sedentary adults aged 16 years or older over Setting: Primary care Outcome: PA or fitness ≥ 12 months after randomization | 8 | 15 RCTs | Narrative summary: Includes interventions described as 'brief' | Larger intervention effects on self-reported PA in studies (six studies*) where control participants received no intervention than where they received a comparator intervention (seven studies*). The authors propose that this suggests that a brief single contact intervention can be as effective as more intensive approaches. *Individual studies not identified. |
| Smith (2004) | Narrative review | Intervention: Interventions to increase PA Design: RCT or quasi-experimental Population: None specified Setting: Primary care Outcome: PA | 3 | 16 studies (15 RCTs) | Narrative summary: Includes interventions described as 'brief' | Brief and intensive interventions* significantly increased activity in the short term. *Individual studies not identified. |

Abbreviations: RCT = randomised controlled trial, nRCT = non-randomised controlled trial, PA = physical activity.

BI reviews (Campbell et al., 2012; Lawlor and Hanratty, 2001) concluded that there was a lack of evidence of long-term effectiveness, defined as 4 months or more by one review (Lawlor and Hanratty, 2001). No BI review reported objective physical activity as an outcome.

Five of the seven PA reviews that performed a statistical analysis or narrative synthesis based on contact time reported a lack of evidence for a relationship between intervention contact time and intervention effectiveness (Avery et al., 2012; Chase, 2015; Conn et al., 2008, 2011; Hobbs et al., 2013), two reported a positive relationship (Conn et al., 2002, 2009). Five of the six PA reviews that described one or more interventions as 'brief' in a subgroup analysis or narrative synthesis reported some evidence supporting the effectiveness of BIs for increasing physical activity (Eakin et al., 2000; Neidrick et al., 2004; Ogilvie et al., 2007; Orrow et al., 2012b; Smith, 2004) (Table 2).

3.3. Factors influencing the effectiveness of brief interventions

Table 5 summarises the factors influencing the effectiveness of BIs as reported in the BI reviews. No PA review investigated factors that influenced the effectiveness of BIs. Two of the three BI reviews investigated factors that influenced the effectiveness of BIs (Campbell et al., 2012; NICE, 2006). One BI review reported inconclusive evidence about the impact of intervention duration of individual sessions on self-reported activity (Campbell et al., 2012). Another BI review reported that follow-up sessions might be more important than individual session duration for effectiveness (NICE, 2006). There was mixed evidence for the impact of including written materials, with one BI review reporting that adding written materials did not increase effectiveness (Campbell et al., 2012), and another reporting that a 'written prescription' may be a useful addition to BIs (NICE, 2006). Overall there was insufficient evidence to identify important effects of tailoring of intervention materials, or types of providers, provider training, setting, or theoretical basis (Campbell et al., 2012; NICE, 2006).

3.4. Target populations for whom brief interventions are more effective

No PA review investigated population factors that influenced the effectiveness of BIs. Two of the three BI reviews investigated whether

population characteristics influenced the effectiveness of BIs (Campbell et al., 2012; NICE, 2006). One BI review reported inconclusive evidence that BIs are more effective for specific age groups, as although the interventions aimed at older groups seemed more effective, these were also the studies that involved follow-up sessions (NICE, 2006). The other BI review reported moderate evidence that BIs were less effective in increasing self-reported levels of physical activity among economically disadvantaged populations (Campbell et al., 2012). Both reviews reported that there was insufficient evidence to determine the impact of gender, ethnicity or baseline activity levels on intervention effectiveness (Campbell et al., 2012; NICE, 2006).

3.5. Feasibility and acceptability of brief interventions

Two of the three BI reviews commented on the acceptability and feasibility of BIs. Table 6 summarises the findings of the BI review that included 46 studies of barriers and facilitators of BI delivery and uptake (Campbell et al., 2012). This review found a number of facilitators of practitioner delivery and patient uptake of BIs, including the availability of support and structured protocols for practitioners delivering the BI and the delivery of advice that is preventative rather than treatment-based. Identified barriers to practitioner delivery included such things as lack of provision of high-quality print materials to reinforce the verbal messages of the BI and a lack of time (Campbell et al., 2012). The other BI review concluded that most interventions could potentially be applied to primary care in the UK with moderate training of health professionals and moderate additional resources (e.g. written materials), but that many BIs were too long (up to 40 min) to be included in primary care consultations in the UK (NICE, 2006).

Two of the thirteen PA reviews commented on the acceptability and feasibility of BIs. One PA review reported that it was feasible to train a range of health care providers to deliver BIs (with training durations ranging between 30 min and 4 h), although consistent implementation might be difficult (Conn et al., 2008). The other PA review reported that patients consistently expressed a preference for interventions including a written contract or prescription; and that practitioners are restricted by financial and time constraints (Neidrick et al., 2004).

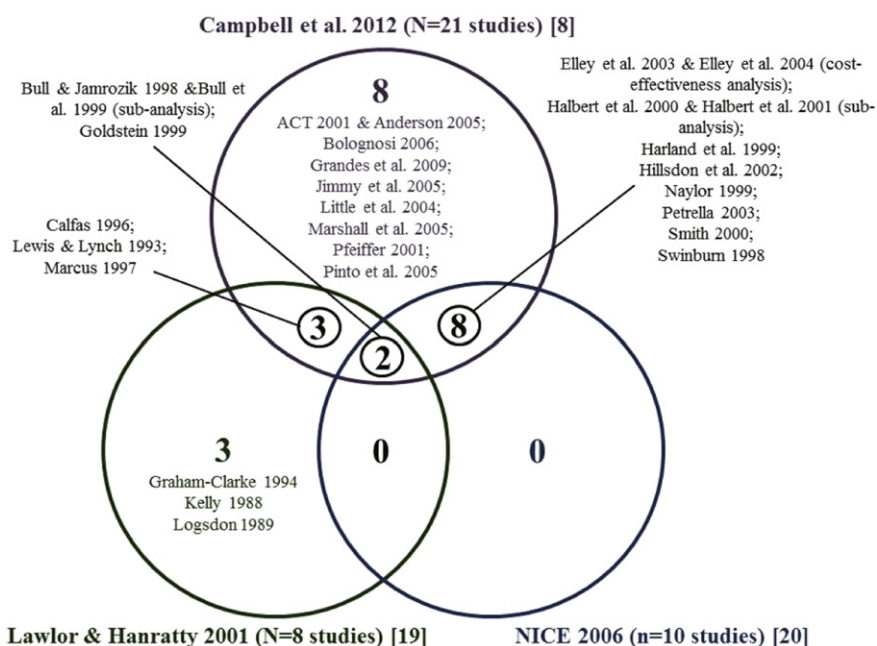


Fig. 2. Venn diagram of overlap of effectiveness studies between Brief Intervention (BI) reviews included in the systematic review of reviews.

Table 3

Definitions of brief interventions provided by the brief intervention reviews included in the systematic review of reviews.

| Study | Definition |
|----------------------------|---|
| Campbell et al. (2012) | <p>"Less than 30 minutes in duration, or delivered in one session (allowing for research follow-up only as additional contact)". (p. 45)</p> <p>"[...] verbal advice, discussion, negotiation or encouragement, with or without written or other support or follow-up. It could be opportunistic and can typically take from less than a minute to up to 20 min. It can vary from basic advice to a more extended, individually-focused discussion." (p. 51)</p> <p>"[...] can be accompanied by provision of support materials (such as printed information, websites, text messaging etc) as additional aids to the brief advice; can involve followup at single or multiple points after the intervention; can be preceded by an assessment; can involve support and followup but these are additional aspects of brief advice and the intervention ("brief advice") should be capable of being delivered in the core brief advice session." (p. 79)</p> |
| Lawlor and Hanratty (2001) | <p>"Advice (defined as verbal/written/other forms of advice) given within the confines of a routine consultation in a primary care setting with the aim of increasing levels of physical activity." (p. 220)</p> <p>This definition of brief advice did not include "[...] dedicated health promotion clinics, referral to exercise facilities, supervised training sessions, lengthy motivational interviews or a combination of these." (p. 219)</p> |
| NICE (2006) | <p>"Any brief intervention involving verbal advice, encouragement, negotiation or discussion with the overall aim of increasing physical activity delivered in a primary care setting by a health or exercise professional, with or without written support or follow-up". (pp. 12–13)</p> <p>"Studies were included if the key element of the intervention was a single initial consultation delivered in a primary care setting (no specific time limit was set for the length of this consultation)." (p. 13)</p> |

4. Discussion

Only three of the sixteen reviews included in this review provided definitions of BIs (using the term "brief advice"), and only one of these definitions specified a maximum duration for brief advice (of 30 min) (Campbell et al., 2012). Overall, evidence from these 3 BI reviews and 13 general PA reviews can be summarised as:

- (i) BIs can increase self-reported physical activity in the short-term, but there is insufficient evidence about their long-term impact, or their impact on objectively measured physical activity.
- (ii) There was mixed evidence that providing high quality supplements (e.g., written prescriptions) or including follow-up sessions may increase the effectiveness of BIs; and there was insufficient evidence to identify the effects of tailoring of intervention materials, types of providers, provider training, setting, or theoretical basis on BI effectiveness.
- (iii) There was insufficient evidence to determine the impact of age, gender, ethnicity, SES or baseline activity levels on BI effectiveness.
- (iv) A number of practitioner, patient, intervention, and system factors (such as the quality of written intervention materials and time constraints of the primary care system) influence the feasibility and acceptability of BIs.

4.1. Definitions of brief interventions

Our findings demonstrate that there is no agreed definition of BIs and that definitions are broad and inclusive and often include interventions that may not be feasible in primary care. For example, although two BI reviews included BIs of 30 (Campbell et al., 2012) or 40 (NICE, 2006) minutes, their definition of BIs did not specify that interventions

that should be deliverable in primary care consultations. Consequently, some BIs included in these two BI reviews were potentially too resource-intensive for delivery in primary care – for example, in addition to the initial brief advice consultation, included BIs involved six follow-up phone calls of 3 min (Hillsdon et al., 2002), at least three follow-up phone calls of 10–20 min (Elley et al., 2003), up to three additional visits (Marcus et al., 1997; Goldstein et al., 1999; Grandes et al., 2009; Petrella et al., 2003), or motivational interviewing (Harland et al., 1999). We recommend that researchers and policy-makers be aware of this diversity in definitions when interpreting evidence and recommendations about BIs. Furthermore, as all three BI reviews provided definitions that focused on verbal advice, they did not necessarily consider other possible types of BIs, such as the provision of pedometers or action planning, that may be more effective than brief advice or enhance its effect (Bravata et al., 2007; Belanger-Gravel et al., 2013).

4.2. Effectiveness of brief interventions

BIs increased self-reported physical activity in the short-term (4–12 weeks), but evidence for their long-term effectiveness is inconclusive. This is in line with previous reviews of general physical activity interventions (Eaton and Menard, 1998; Van der Bij et al., 2002; Müller-Riemenschneider et al., 2008), and may be partly due to varying definitions of short-term across reviews (6 weeks up to 12 months), which would mean that studies with long-term effects may have been categorised differently in the different reviews. There is also a lack of evidence about the effect of BIs on objectively measured physical activity and fitness. This again corroborates evidence from previous reviews (Orrow et al., 2012a; Neville et al., 2009), and reflects the fact that very few studies evaluating BIs have used an objective measure of physical activity.

4.3. Factors influencing the effectiveness of brief interventions

In terms of factors influencing the effectiveness of BIs, we found mixed support for the use of supplements such as written prescriptions. It is possible that the varied quality of written materials across studies has contributed to this mixed evidence. Indeed one review recommended that higher quality materials are used when trying to establish whether these increase effectiveness (Campbell et al., 2012). Collaborative work with patients and practitioners might improve the quality of materials (NIHR, 2014).

We identified only three reviews that specifically investigated the effectiveness of BIs (Campbell et al., 2012; Lawlor and Hanratty, 2001; NICE, 2006), of which only one performed meta-analyses to compare BIs with usual care or with more intensive interventions (Campbell et al., 2012). Consequently, the evidence for the impact of intervention duration is inconclusive, and illustrates a need for more studies comparing BIs of varying durations among themselves and against usual care.

The lack of evidence about the impact of tailoring, types of providers, provider training, intervention setting, and theoretical basis on BI effectiveness likely reflects the heterogeneity of BI studies i.e. the variety of methods used to tailor BIs, or the different variables tailoring was based on (e.g. psychosocial, behavioural and demographic variables); the varied types of intervention provider and the quantity and quality of training they received; and the theoretical basis (or lack thereof) of the interventions. Future reviews, as well as future individual studies, should evaluate different methods of tailoring BIs (e.g. tailored pamphlets) and the use of different tailoring variables. Furthermore, the limited evidence about promising behaviour change techniques for use in BIs underlines the need for studies that compare BIs that use different techniques. Finally, the inconclusive evidence for the effects of different types of providers and settings suggests a need for studies that compare the effects of the same BIs delivered by different providers (e.g., nurse, general practitioner) and delivered in different settings (e.g., primary care, community, at participants' homes).

Table 4

Brief intervention effectiveness according to the brief intervention reviews included in the systematic review of reviews.

| Study | Comparisons | Method of comparison N studies | Outcome | Follow-up time | Results |
|----------------------------|--|---|---------------------------------|--|--|
| Campbell et al. (2012) | Brief advice to promote PA vs Usual care | Narrative synthesis: 15 effectiveness studies (10 RCTs; 5 nRCTs) Meta-analysis (continuous PA data): 8 effectiveness studies (6 RCTs; 2 nRCTs) Meta-analysis (dichotomous PA data): 9 effectiveness studies (7 RCTs; 2 nRCTs) | Self-reported physical activity | 4–6 weeks to 12 months | Narrative synthesis: Six studies (inc. 5RCTs) found a significant positive effect of brief advice in promoting physical activity; seven studies (inc. 4 RCTs) found a non-significant benefit of brief advice over usual care; two studies found no difference between brief advice and usual care. Meta-analysis (continuous PA data): Brief advice produced a small effect size (SMD 0.17 (95% CI 0.06 to 0.28) I2 69%). Meta-analysis (dichotomous PA data): The relative risk of meeting recommended physical activity levels was 1.30 (95%CI: 1.12 to 1.50; I2 66%) in favour of brief advice. |
| Lawlor and Hanratty (2001) | Brief physical activity advice vs Control (not given advice to increase activity levels) | Narrative synthesis 8 studies: 2 RCTs; 6 nRCTs (5102) | Self-reported physical activity | Short-term: <8 weeks Long-term: ≥4 months | Short-term: 4 of 6 studies reporting short-term results found PA advice to be effective at increasing physical activity. Long-term: 1 of 4 studies reporting long-term results found PA advice to be effective at increasing physical activity. One of the RCTs found null results at both short and long-term follow-up; the other only assessed long-term outcomes and found null effects at both 4 and 12 months. |
| NICE (2006) | Brief interventions (BIs) for PA vs Control | Narrative synthesis 10 studies: 7 RCTs; 3 nRCTs (6898) | Self-reported physical activity | Short-term: 6–12 weeks Longer-term: >12 weeks Very long term: ≥1 year | Evidence from 10 studies suggests that brief interventions in primary care to increase physical activity can have short, longer- term or very long- term effects: Short-term: 3 of 6 controlled trials (3 of 4 RCTs) found Brief PA advice to be effective at increasing physical activity. Longer-term: 3 of 7 controlled trials (2 of 4 RCTs) found Brief PA advice to be effective at increasing physical activity. Very long-term: 3 of 7 controlled trials (3 of 6 RCTs) found Brief PA advice to be effective at increasing physical activity. |

Abbreviations: RCT = randomised controlled trial, nRCT = non-randomised controlled trial, PA = physical activity, BI = brief intervention.

4.4. Target populations for whom brief interventions are more effective

Likewise, we found mixed and limited evidence for the impact of targeting BIs at patients with various characteristics, although there was some evidence that BIs might be more effective among patients of higher socio-economic status. Consequently, there is a need for formative research in disadvantaged populations to ensure that BIs are tailored to their needs and preferences. It is well known that disadvantaged population are often difficult to engage in physical activity research (Chinn et al., 2006), however, and future research should also endeavour to reduce this inequity (Attwood et al., 2016), for example by involving these populations in research design and by using approaches which are tailored to these populations.

4.5. Feasibility and acceptability of brief interventions

Only two of the three included BI reviews and two of the thirteen included PA reviews commented on the acceptability and feasibility of BIs, allowing only tentative conclusions to be drawn. With regard to the feasibility and acceptability of BIs, practitioners mentioned time constraints as a key barrier (Campbell et al., 2012; NICE, 2006; Neidrick et al., 2004). Although there was insufficient evidence from the included BI reviews to identify important effects of intervention provider on the feasibility and acceptability of BIs, the impact of the type of provider (e.g. general practitioner, nurse, health care assistant, etc.) deserves

further investigation, especially in the primary care context where members of staff face different time constraints. The development and evaluation of very brief interventions (VBIs), defined as having a duration of 5 min or less (National Institute for Health and Care Excellence, 2013) might address this barrier, especially within the context of primary care consultations (NICE, 2006). Providers can feasibly be trained to deliver BIs within a few hours, but evidence for implementation fidelity is lacking. Although there is mixed evidence for including written materials in BIs to increase their effectiveness, evidence from one BI review suggested that adding structured, clear and simple protocols, high quality written materials, and system-level support to BIs may encourage their delivery by providers (Campbell et al., 2012). Furthermore, BIs that promote physical activity as a preventative measure, rather than as treatment for a perceived medical condition, might be more acceptable to participants. In view of these findings, we suggest that policies should highlight that physical activity promotion is part of the core role of primary care practitioners and that BIs are a preventative measure that can benefit all inactive patients, not just those with a diagnosed medical condition or other at-risk groups.

4.6. Limitations

It is possible that relevant reviews may have been missed, given the lack of consistency across PA reviews in describing interventions as brief, and the use of contact time as a proxy for BIs. Furthermore, our search strategy was limited to electronic databases and the first author's

Table 5
Factors influencing the effectiveness of brief interventions.

| Study | Method of comparison | Summary of findings |
|----------------------------|---------------------------------------|---|
| Campbell et al. (2012) | Narrative synthesis | <ul style="list-style-type: none"> • Intervention duration: Weak evidence from nine studies (six RCT studies and three nRCTs) provides inconclusive evidence regarding the effectiveness of intervention of different durations. |
| | and | |
| | Descriptive summary of studies | <ul style="list-style-type: none"> • Written materials: Moderate evidence from four studies (three RCTs and one nRCT) suggests that there is no additional benefit in combining brief advice with written materials. The authors note that the lack of statistical significance may reflect the small number of studies and considerable heterogeneity and suggest that caution is needed in interpretation of this finding. • There was insufficient evidence to identify important effects from: <ul style="list-style-type: none"> –Types of provider –Provider training –Setting –Theoretical basis of the intervention/-behaviour change techniques |
| Lawlor and Hanratty (2001) | N/A | None reported. |
| NICE (2006) | Narrative synthesis | <ul style="list-style-type: none"> • Follow-up sessions: Follow-up sessions after the initial consultation may be important in achieving improvement in physical activity outcomes over a very long time frame (12 months). Follow-up over an appropriate time period appears to be more important than the length of individual sessions |
| | and | |
| | Descriptive summary of studies | <ul style="list-style-type: none"> • Written prescriptions and/or step testing: A 'written prescription' outlining physical activity goals and/or step testing during the consultation may be a useful adjunct to verbal advice to increase physical activity. The authors note that it is difficult to separate the relative contribution of these elements of the intervention from the impact of follow-up sessions. • There was insufficient evidence to identify important effects from: <ul style="list-style-type: none"> –Tailoring of intervention material to individuals –Types of provider –Setting |

Abbreviations: RCT = randomised controlled trial, nRCT = non-randomised controlled trial, PA = physical activity, BI = brief intervention.

collection. However, this is unlikely since we took an inclusive approach to incorporating PA reviews and they reported very limited evidence. Our findings should be interpreted with caution due to the varying quality of the reviews and the included primary studies.

4.7. Implications for practice and policy

Given these findings, policy-makers, commissioners and practitioners should be aware that evidence and recommendations about BIs are partly based on interventions that are too long for primary care consultations (The Information Centre, 2006). We recommend that researchers distinguish brief interventions (BIs) and very brief interventions (VBIs), as done in some NICE guidance (National Institute for Health and Care Excellence, 2013), and that VBIs are defined as interventions that can be delivered within a single five-minute session. We also recommend that researchers consider types of BIs other than brief advice, for example those that use pedometers or include behaviour change techniques such as action planning.

Table 6
Summary of barriers and facilitators of Brief Intervention delivery and uptake identified by Campbell et al. (2012).

| Facilitators of practitioner delivery of brief interventions | Facilitators of patient uptake of brief interventions |
|---|---|
| <i>Practitioner-related factors:</i> | <i>Intervention-related factors:</i> |
| <ul style="list-style-type: none"> • Positive views about the health benefits of physical activity, and effectiveness of brief advice. • Perception that physical activity promotion is part of their role. • Knowledge of physical activity and confidence in delivering brief interventions and promoting physical activity. • Practitioners who are more physically active. • Perception that a patient has certain characteristics. • Perceived likelihood of patient uptake of advice. | <ul style="list-style-type: none"> • Advice is preventative (rather than treatment-based). |
| <i>Intervention-related factors:</i> | <i>Practitioner characteristics:</i> |
| <ul style="list-style-type: none"> • Structured protocols with clear and simple messages and process. • Insufficient evidence for use of technology to increase BI delivery. | <i>Patient characteristics:</i> |
| <i>System/structural factors:</i> | <ul style="list-style-type: none"> • Appearance/dress, ease of availability, perceived intelligence compared to other general practitioners. • Higher education and income levels. • Already physically active. • Better recall and understanding of advice. • Awareness of physical activity recommendations. • Older patients who feel they are being listened to. • Offer of incentives (e.g. financial or cash equivalents) to act on advice. • More receptive of treatment-based advice when ready to change or have a relevant condition. |
| Barriers to practitioner delivery of brief interventions | |
| <i>Intervention-related factors:</i> | |
| <ul style="list-style-type: none"> • Perceived lack of provision of high quality print materials to reinforce verbal messages. • Perceived lack of provision of financial incentives. • Perceived lack of provision of other support resources (e.g., knowledge of downstream structures and structural support). | |
| <i>System/structural factors:</i> | |
| <ul style="list-style-type: none"> • Lack of time. | |

5. Conclusions

Our review indicates uncertainty about the effectiveness, feasibility and acceptability of BIs that could be delivered in a primary care consultation. We have also identified a need for studies to investigate intervention effects on objectively measured and self-reported physical activity in the long term. Importantly, current definitions of BIs include interventions that are too long for primary care consultations. Practitioners, commissioners and policy-makers should be aware of this when interpreting evidence about BIs, and future research should develop and evaluate very brief interventions (of 5 min or less) which may be more feasible to deliver in a routine consultation than BIs and may prove to be cost-effective, scalable interventions.

Conflict of interest statement

WH has done consultancy work for AbbVie Ltd. The other authors declare that they have no conflicts of interest.

Authors' contributions

LL, DM, SS, and WH contributed to review design. LL and SP executed the search strategies, screened initial search results, extracted data from

included studies, undertook narrative synthesis, drafted the manuscript, and are guarantors of the study. LL, SP, WH, KM, MB and SS assessed studies for inclusion. WH, DM, KM, SP, and MB double-checked the data extraction. LL, SP, WH and SS interpreted the findings. All authors contributed to the manuscript, and read and approved the final manuscript.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <http://dx.doi.org/10.1016/j.ypmed.2017.02.017>.

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